DOCUMENT RESUME

ED 399 178 SE 058 885

AUTHOR Altschuld, James W.
TITLE Evaluation of Project Symbiosis: An Interdisciplinary Science Education Project.
PUB DATE 93
NOTE 4p.
PUB TYPE Reports - Descriptive (141) -- Journal Articles (080)
JOURNAL CIT Cognosos; v2 n3 p4-5 Sum 1993

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Agricultural Education; Change Strategies; *Educational Change; *Evaluation Methods; *Interdisciplinary Approach; Science Curriculum; Science Programs; Secondary Education; Team Teaching

ABSTRACT

The goal of this report is to provide a summary of the evaluation of Project Symbiosis which focused on enhancing the teaching of science principles in high school agriculture courses. The project initially involved 15 teams of science and agriculture teachers and was characterized by an extensive evaluation component consisting of six formal elements and one informal element. Data collected for evaluative purposes included preparticipation information, workshop evaluations, post-workshop telephone interviews, teacher generated products, and on-site interviews. Preliminary implications of Project Symbiosis suggest that evaluation methods must be multifaceted, the interdisciplinary teacher teaming requires extended periods of time, and structures within schools should be altered to assist teams. (DDR)

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# EVALUATION OF PROJECT SYMBIOSIS:

## An Interdisciplinary Science Education Project

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# Evaluation of Project Symbiosis: An Interdisciplinary Science Education Project

*Based on a presentation by James W. Altschuld for the panel entitled "The Changing Role of Evaluation in Reforming Science Education" at the Annual Meeting of the American Evaluation Association*

## Overview of the Project and Evaluation Considerations

In 1990, three faculty members (Rosemarie Rossetti, Project Director; N.L. McCaslin; and Wesley Budke) in the Department of Agricultural Education at The Ohio State University and James Altschuld, Evaluation Coordinator at NCSTL began to design a project to form interdisciplinary teams of secondary science and agriculture teachers. [Note: It must be emphasized that the project was a team effort of the four individuals identified above and two Graduate Research Associates, Carol Bezek and Inyoung Kim, of the NCSTL who constructed and analyzed the data base.] The main purpose was to enhance the teaching of science principles in high school agriculture courses. Agricultural education was chosen due to the fact that knowledge and application of varied science principles are required for successful farming as well as other agriculturally related business and industry endeavors. It was also felt that the teaching of science in agriculture needed to be improved in light of the necessity to teach many diverse issues and topics in agriculture.

The key features of the project were as follows:

a) recruitment via established agricultural education networks of agricultural teachers from throughout the State of Ohio to participate with their personally identified science teaching counterpart;

b) the development of five, day-long workshops to be implemented on a monthly basis starting in the Fall of 1991 with the last one taking place in February of 1992;

c) the requirement that teachers make a commitment to take part in a large set of evaluation procedures designed for the project and that they develop and, if possible, try out assignments, demonstrations, team teaching, or other results of their interdisciplinary teaming.

In line with these features 15 teams were elected or chosen to be involved during the summer of 1991. The faculty from Agricultural Education and the Evaluation Coordinator planned the five workshop programs recognizing that various science disciplines and different interests in agriculture were represented in the sample of participants. The presenters were from agribusiness and industry, the university, government, school systems, and science organizations. Topics included water quality, the properties of the egg, advances in plant science, animal genetics and breeding, biotechnology, environmental management, ideas for team work, and the evaluation of the project.

As was expected most of the teachers were from smaller, more rural schools. The project paid for: substitutes while the teachers attended the workshops; transportation to and from workshops; and per diem expenses. In addition, a nominal amount of support was provided for teacher activities in schools.

Originally, a somewhat extensive evaluation was proposed for the project. Upon review of the proposal the sponsor requested that the evaluation be expanded and accordingly the evaluation structure contained six formal elements and one informal one. The formal elements were: (1) collection of pre-participation information regarding background variables, expectations and perceptions of the concept of interdisciplinary teaming; (2) evaluations of each workshop via closed and open-ended questions; (3) telephone interviews with half of the team members after the first workshop and similar interviews with the other half after the second workshop; (4) teacher maintained monthly log sheets of activities; (5) collection and analysis of teacher generated products; and (6) on-site interviews conducted with six of the teams in April and May. The informal element consisted of evaluator and faculty observations made during the course of events such as noting the comments of teachers. The evaluation philosophy expressed to teachers at the initial workshop was that the project was developmental in nature and their feedback and ideas were welcomed. They were encouraged to be open and frank in their comments.

Given the scope of the evaluation, results from a preliminary analysis of the data were submitted to the Kellogg Foundation in 1992. Since that time we have constructed a data base system that facilitates in-depth probing related to questions about the nature of interdisciplinary teaming. In this manner, insights should be gained for the development of subsequent projects of this type based upon better understanding of the interdisciplinary teaming process.

Now, let us focus on the multifaceted considerations that go into designing an evaluation of a teamwork project such as this one. A description of selected major results will also be given.

## Evaluation Design Considerations

**First**, the question arises as to what is meant by the concept of interdisciplinary teaming and what should be the end result or outcome? What is the nature of the criterion in this project both in terms of process and product? What are likely expectations given the less than one year time frame? What would demonstrate that the project has had an impact and what type of impact should it be? Project staff frequently discussed outcomes including changes in teacher behavior, concrete evidence that the interdisciplinary work has affected course content and instruction, enhanced teacher perceptions and understandings regarding the substantive content of the workshops, conceptual changes in how teachers view teaching, effects on others within the school setting, effects on student learning, clear evidence of an interdisciplinary outcome, and sustainability of the team beyond the conclusion of the project. Many possibilities exist with each one having unique implications for evaluation design and implementation.

The questions just examined reflect different perspectives of the goals of the project. The position adopted in this evaluation is that the goal was to enhance interdisciplinary teaming. In other words, the teacher is the main recipient of project services and that's where the emphasis of the evaluation should be. The other position would be that the students are the ultimate



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beneficiaries and the evaluation should ascertain their views, feelings and knowledge changes.

**Second**, another concern is to what extent is it possible to describe the process of interdisciplinary teaming in the schools. (Description of the process was important for purposes of generalization.) The 15 teams were spread throughout the state and limited evaluation dollars and time were available to support on-site visits. Also it is unclear as to what should be observed during site visits especially if teachers were in an early discussion, idea generating, planning mode. Under such conditions and with the recognition that monitoring of the process was desirable, proxy measures were used in place of direct observation and investigation. Phone interviews, teacher logs, and informal discussions and observations at the workshops were the main sources of data.

**Third**, how much data can realistically be collected from busy full time teachers without becoming a resented imposition. Over time, it is likely that the completion of forms and logs would become perfunctory. What is the quality of logs if they were produced 'after-the-fact' and represented retrospective recall more than data immediately written at the occurrence of an event? Thus the reliability and validity of the information collected in general, and teacher logs, in particular, are vulnerable to question in this regard.

**Fourth**, it may be difficult to combine information from multiple sources of data into a meaningful, coherent picture. The data generated comes from a teacher characteristics form (n=30 teachers from 15 teams), pre workshop questionnaires (n=30) which established a baseline of teacher perceptions and expectations, five fairly in-depth workshop questionnaires with an average completion rate of more than 85 percent, 30 telephone interviews completed over a two month period, more than seventy five log sheets submitted by teams or individual team members over four separate time periods, teacher produced products and plans, and six on-site interviews with teacher teams that lasted about one and one half hours. This rich base contains extensive qualitative and quantitative information.

## Selected Findings from Project Symbiosis

• One interesting and somewhat surprising finding was that there was limited prior team work experience and especially in regard to serious attempts at interdisciplinary teaming. The literature also contained few examples of or studies related to interdisciplinary teaming at the secondary level.

• Another finding was that most teachers who participated were highly experienced (more than 12 years on the average) possibly indicating that one had to feel fairly comfortable in the teaching role before embarking on a teaming approach. Another related interpretation might be that with experienced teachers it may be more difficult to change or alter established teaching routines.

• Not unexpectedly teachers consistently showed the highest preferences for workshop presentations that explained the basic theoretical, conceptual underpinnings for a principle followed by hands-on opportunities that could be applied to their classrooms. From an analysis of written comments and scaled items, teachers were satisfied with the content chosen for the workshops and the quality of presenters.

• Notably lower preferences were expressed for those parts of the workshops that dealt with teaming strategies and issues. This may reflect the quality of the presentation, underlying teacher needs and expectations, and/or a combination of both of these factors.

• A portion of the teams did achieve a measure of interdisciplinary activity whereas others demonstrated limited achievement in this regard. Several teams dropped out citing not the basic premises of the project but severe time constraints affecting their ability to attend workshops, to meet as a team and to complete assignments.

• Systemic problems were noted throughout the evaluation process. Many of the teachers did not have common free periods in which to discuss teaming activities and large blocks of planning/meeting time were not in evidence. Teachers did not share the same students nor, as a general rule, were they located in physical proximity to each other. Meetings were generally of short (under 20 minutes) duration. Most teachers were familiar with but had not observed their teammate teaching a class. Schools do not have formal provisions for observing and exchanging ideas about teaching. The agriculture teacher, as anticipated, almost always had more flexible space and physical arrangements than did the science teacher. While administrative facilitation was not present to a major degree, administrative hindrance also was not there.

## Preliminary Implications of Project Symbiosis

**Evaluation must be multifaceted.** Single instruments or approaches to evaluation will not provide the quality and depth of information necessary for understanding what is taking place.

**Interdisciplinary teaming requires an extended period of time.** If we learned one thing, it is that this teaming process requires a great deal of time for teachers to get acquainted, to conceptualize, to develop, and to implement ideas. Allot two years or more.

**Interdisciplinary teams need facilitation.** Teams don't occur by themselves. A project base or central facilitation mechanism has to be there.

**Administrators need to be involved in interdisciplinary teaming.** The involvement should relate to appreciating the process and its value, developing teacher schedules to accomodate teaming, and reinforcing the process in any way possible.

**Structures within schools should be altered to assist teams.** Planning a year in advance is desirable for establishing time (free periods) for teachers to work together, for scheduling groups of students common to teachers, as well as for making other provisions to enhance the team performance.

*Initial funding of this effort by the Kellogg Foundation is gratefully acknowledged and another proposal for continuing and expanding it is currently pending.*

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**Phone:** (614) 292-3339

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**or just write us at:**
NCSTL
1929 Kenny Road
Columbus, OH 43210-1015